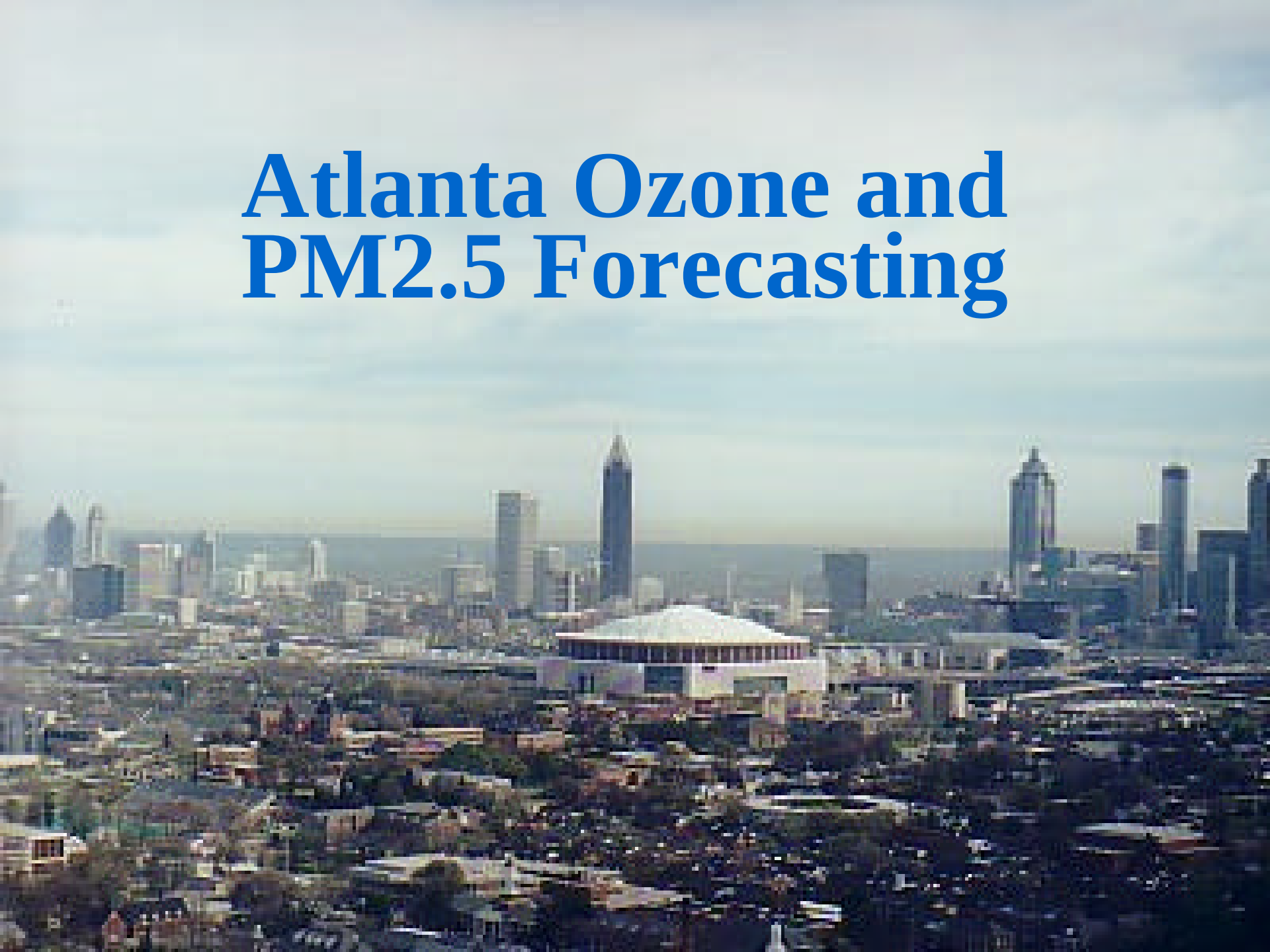
Atlanta Ozone and PM2.5 Forecasting



Forecasting:

Began forecasting ozone for Metro Area in 1996.

Began forecasting PM2.5 for Metro Area in 2003.

Forecasting Program

- Team consists of meteorologists and air quality modelers from Georgia EPD and Georgia Tech.
- Forecasting Tools:

a. Multiple Linear Regression Model, Decision-Tree, Close Neighbor Models

b. UAM (3D clear-sky)

c. Meteorological and Chemical Data

d. NWS Synoptic Models (GFS,ETA….)

Methodology:

Consensus Component, Submit forecast at 1330 LST.

(Discussion with NC and SC)

ATLANTA FORECASTING TEAM

O3 PREDICTIONS

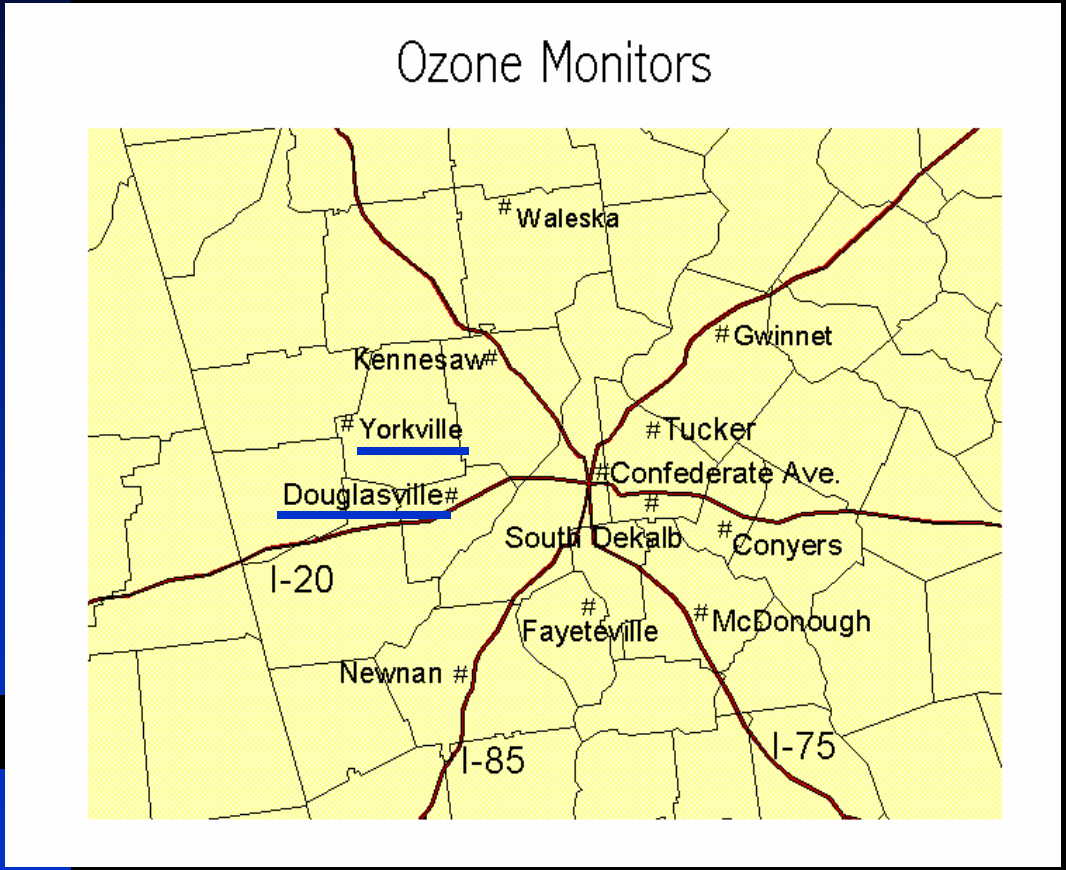
Successful predictions (1999-2003)

Year	Binary	AQI	#Viol
1999	83.7%	53.6%	69
2000	81.7%	58.2%	46
2001	86.9%	63.4%	20
2002	84.3%	66.0%	37
2003	93.3%	67.8%	13

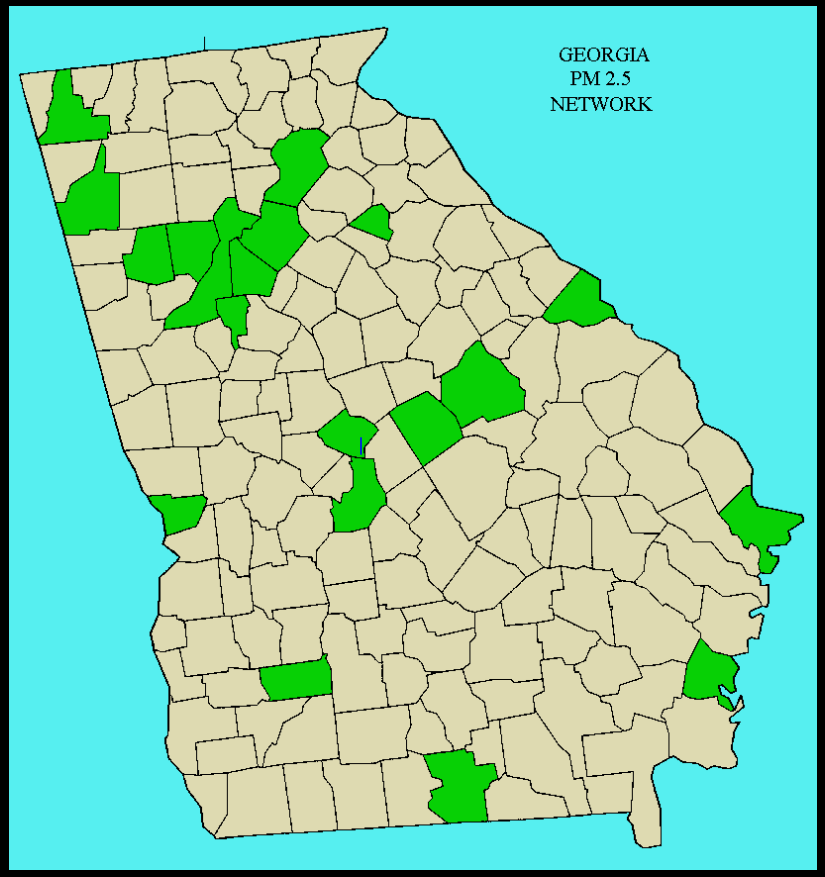
- PM2.5 PREDICTIONS
- Successful predictions (Oct 2003 - Jan 2004)

- Year AQI Category
- ----------
- 2003 76.1%
- 2004 ?? (1 Viol)

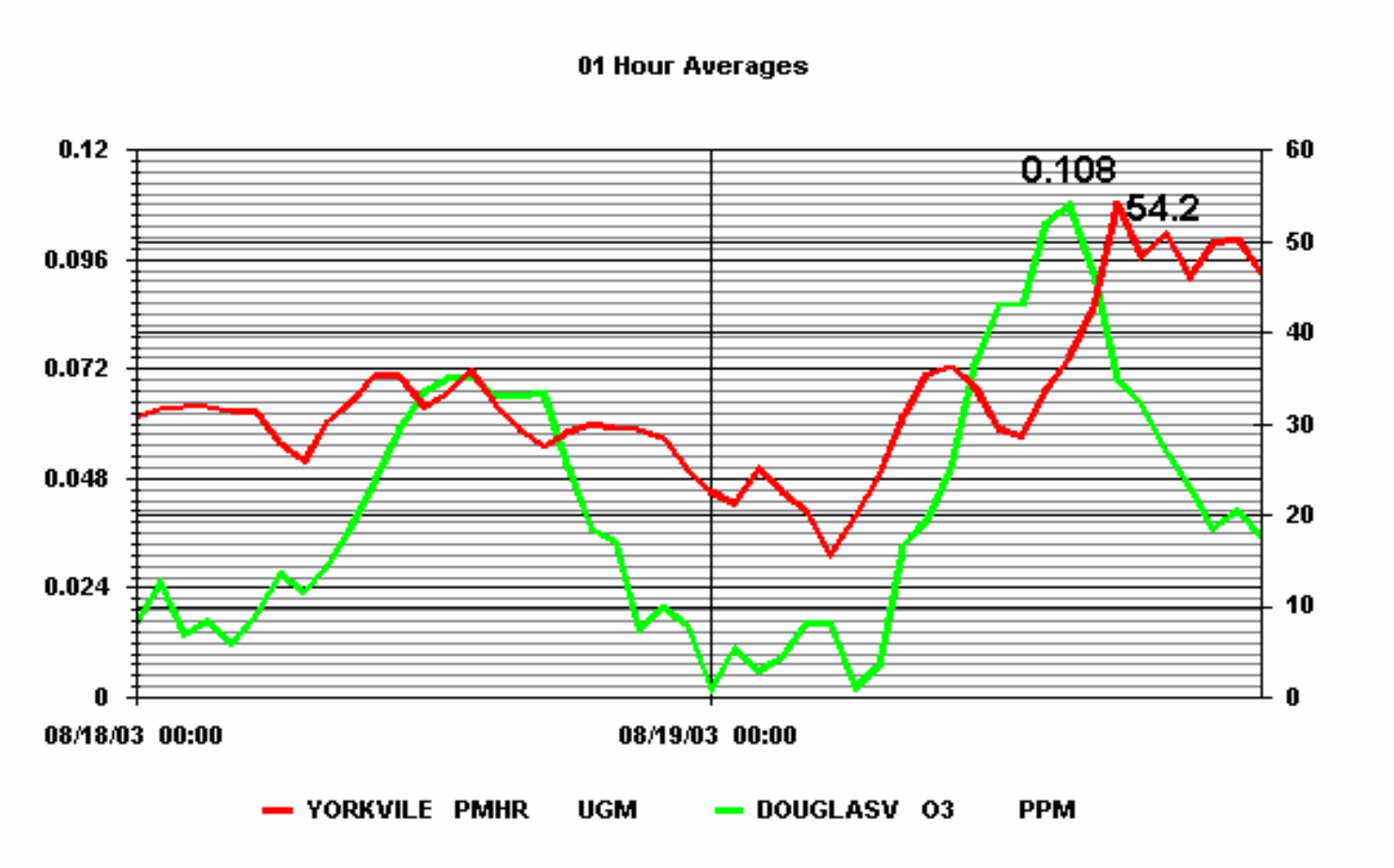
Metro Ozone Network



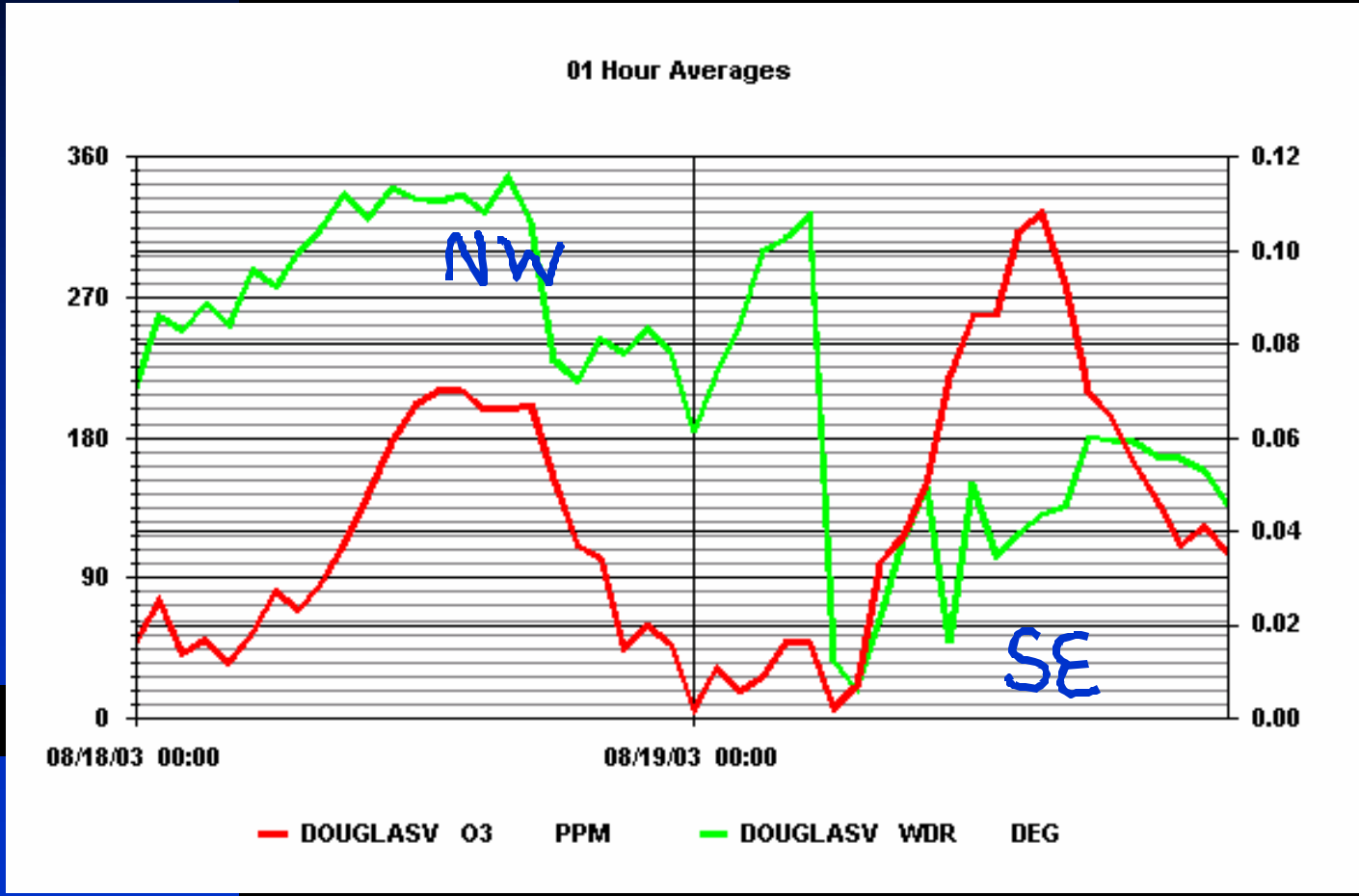
GA PM2.5 Network

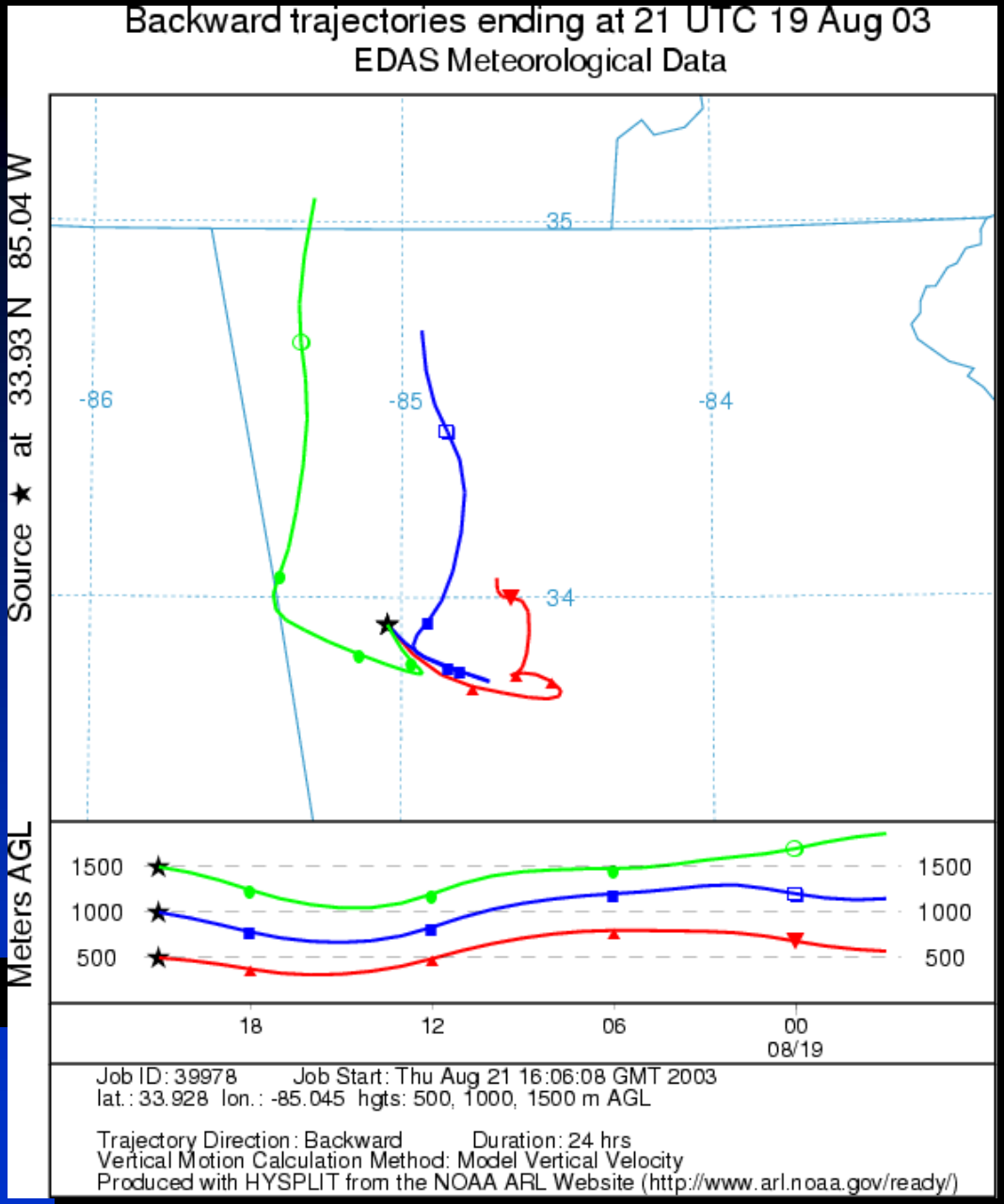


PM2.5 and O3 Episode (8/19/03)

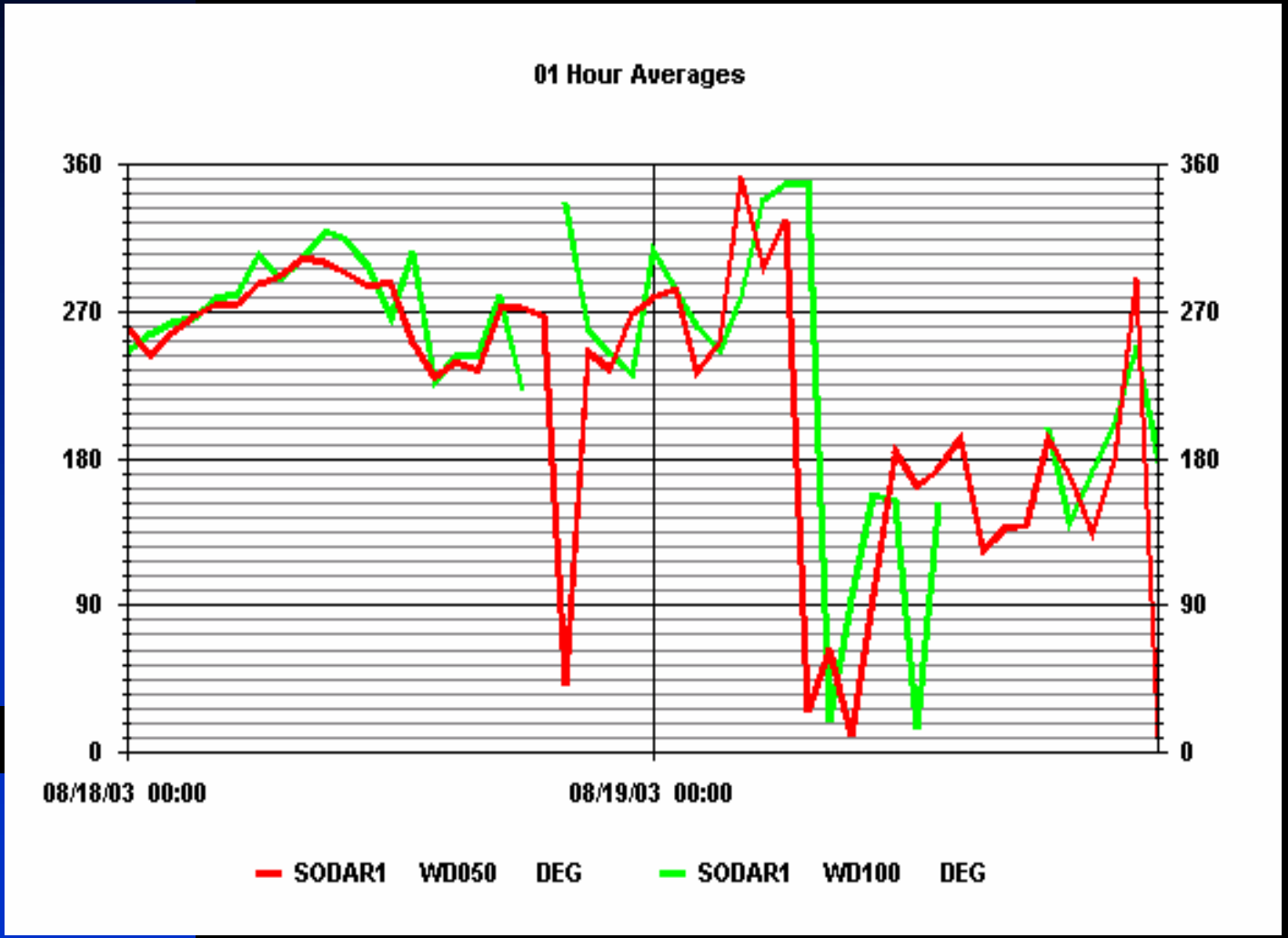


Recirc at Douglasville (NW to SE flow)

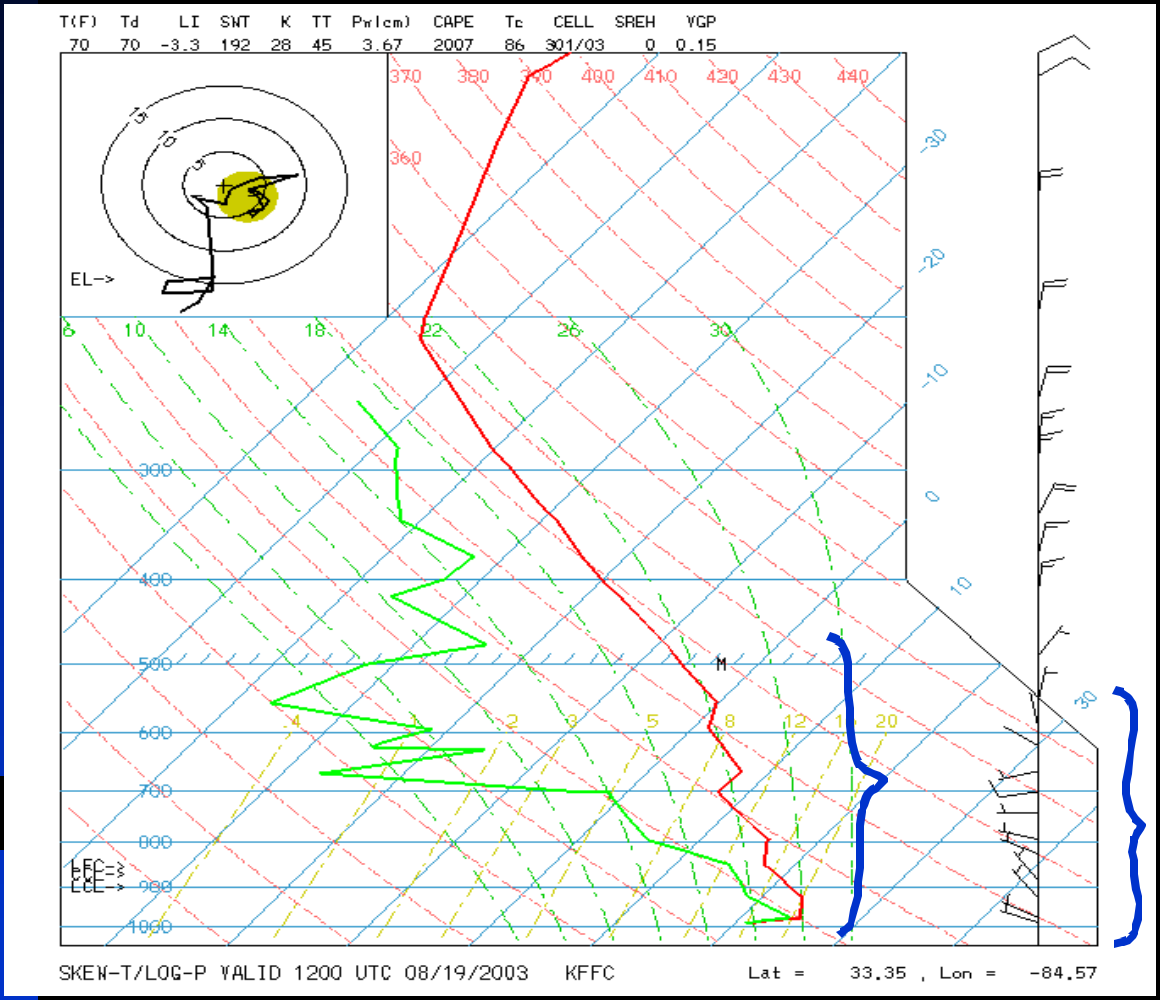


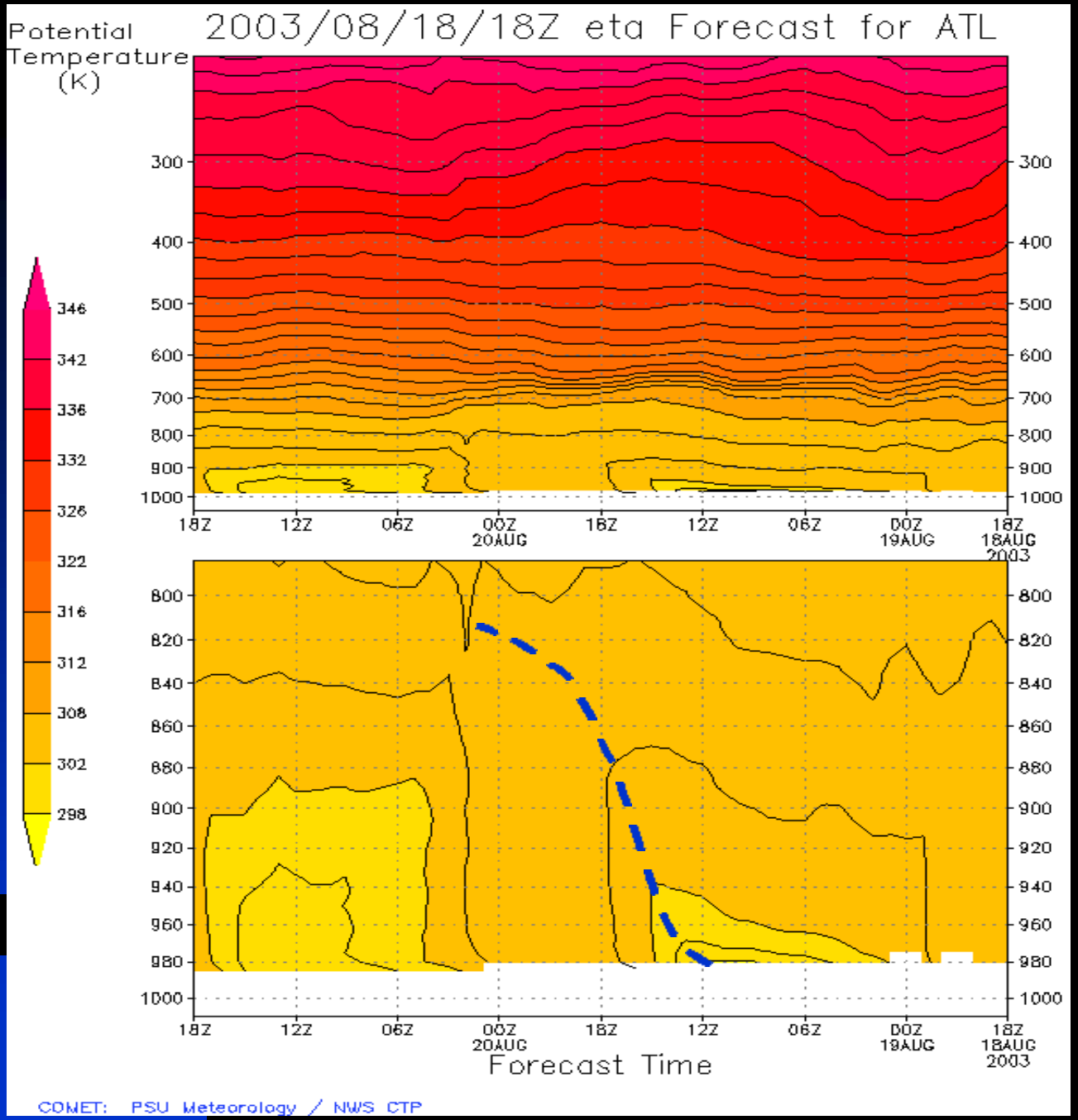

Backward trajectories ending at 21 UTC 19 Aug 03
EDAS Meteorological Data
Source ★ at 33.93 N 85.04 W
35
-86
-85
-84
34
Meters AGL
1500
1000
500
1500
1000
500
18
12
06
00
08/19
Job ID: 39978 Job Start: Thu Aug 21 16:06:08 GMT 2003
lat.: 33.928 lon.: -85.045 hgts: 500, 1000, 1500 m AGL
Trajectory Direction: Backward Duration: 24 hrs
Vertical Motion Calculation Method: Model Vertical Velocity
Produced with HYSPLIT from the NOAA ARL Website (http://www.arl.noaa.gov/ready/)

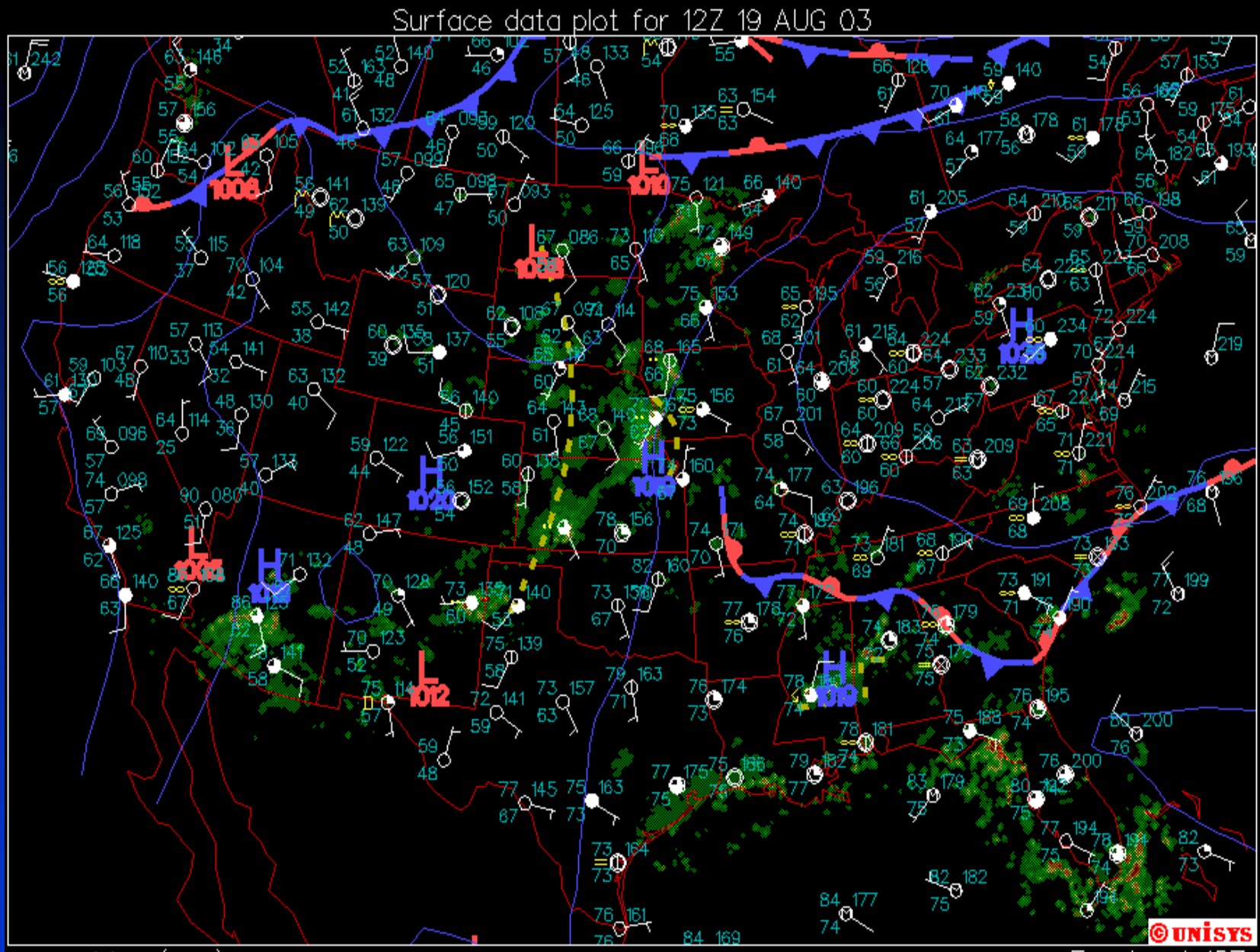
PA1-LR 500,1000m WDR



FFC Sounding 8/19/03




Potential Temperature (K)
2003/08/18/18Z eta Forecast for ATL
346
342
336
332
326
322
316
312
308
302
298
300
400
500
600
700
800
900
1000
18Z
12Z
06Z
00Z 20AUG
18Z
12Z
06Z
00Z 19AUG
18Z 18AUG 2003
800
820
840
860
880
900
920
940
960
980
1000
Forecast Time
COMET: PSU Meteorology / NWS CTP

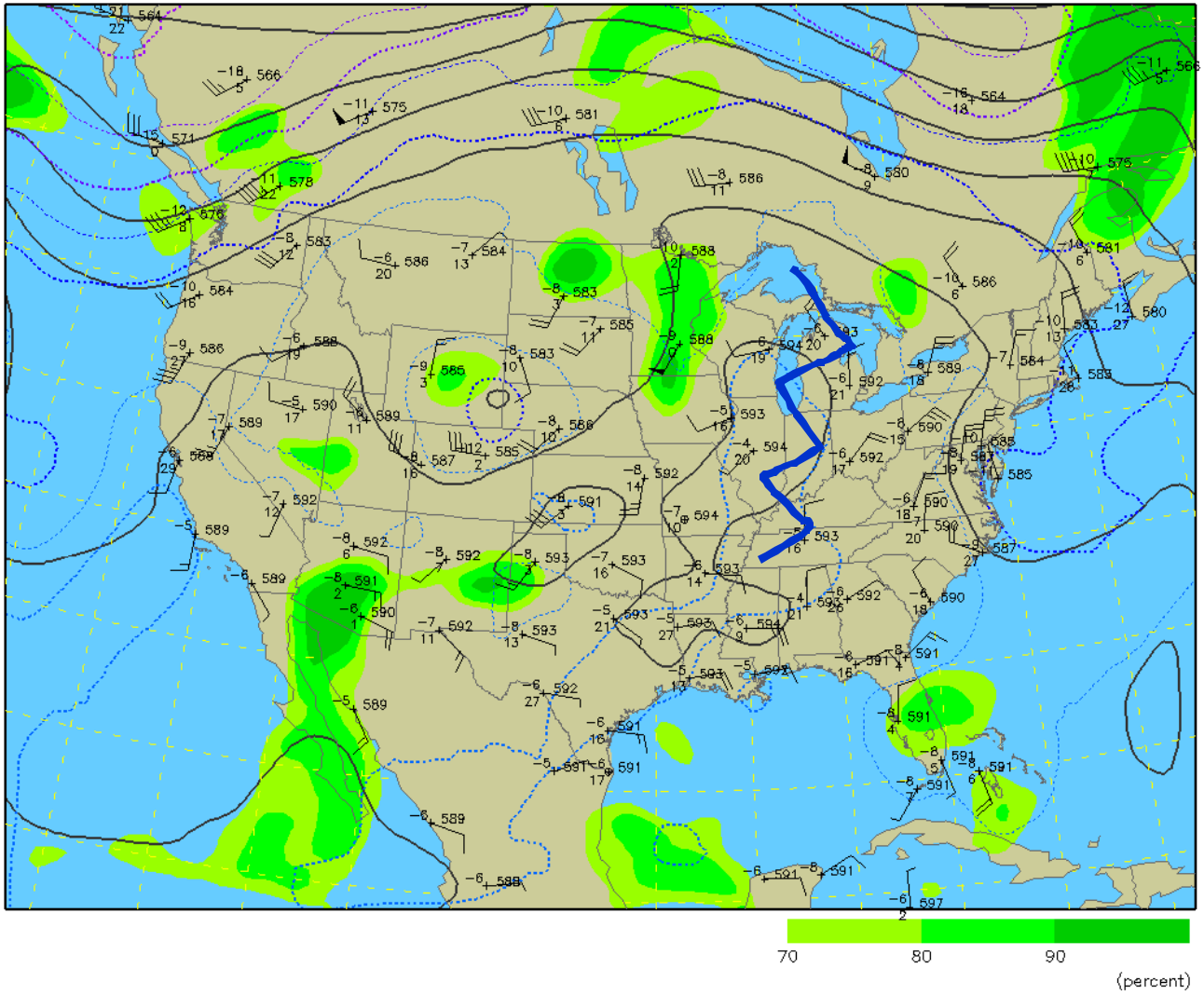

Surface data plot for 12Z 19 AUG 03
Intensities (Dbz): 20 30 40 45 50 55
Fronts at 12Z
©UNISYS

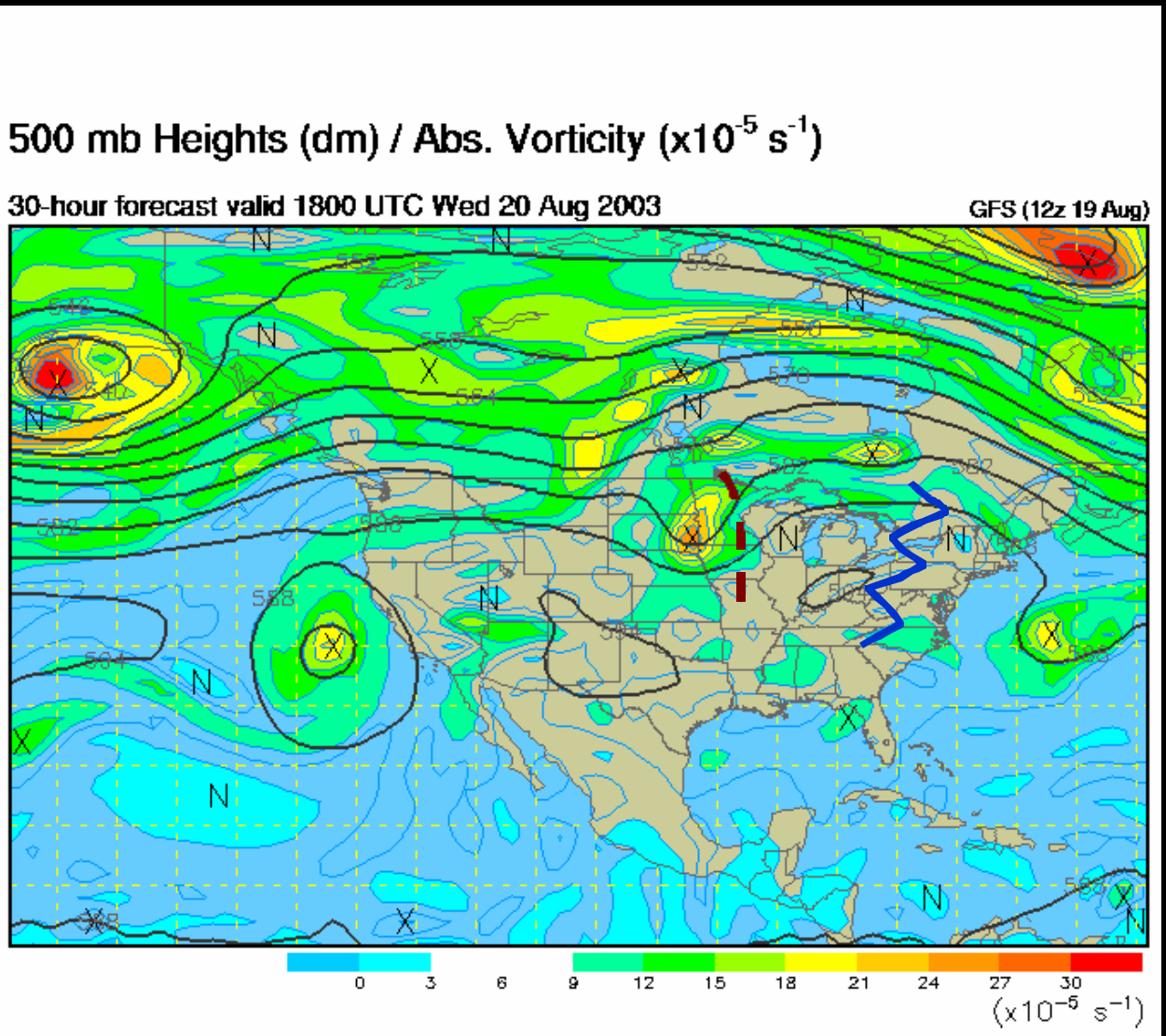
500 mb rawinsonde data 12z Tue 19 Aug 2003

500 mb Heights (dm) / Temperature (°C) / Humidity (%)

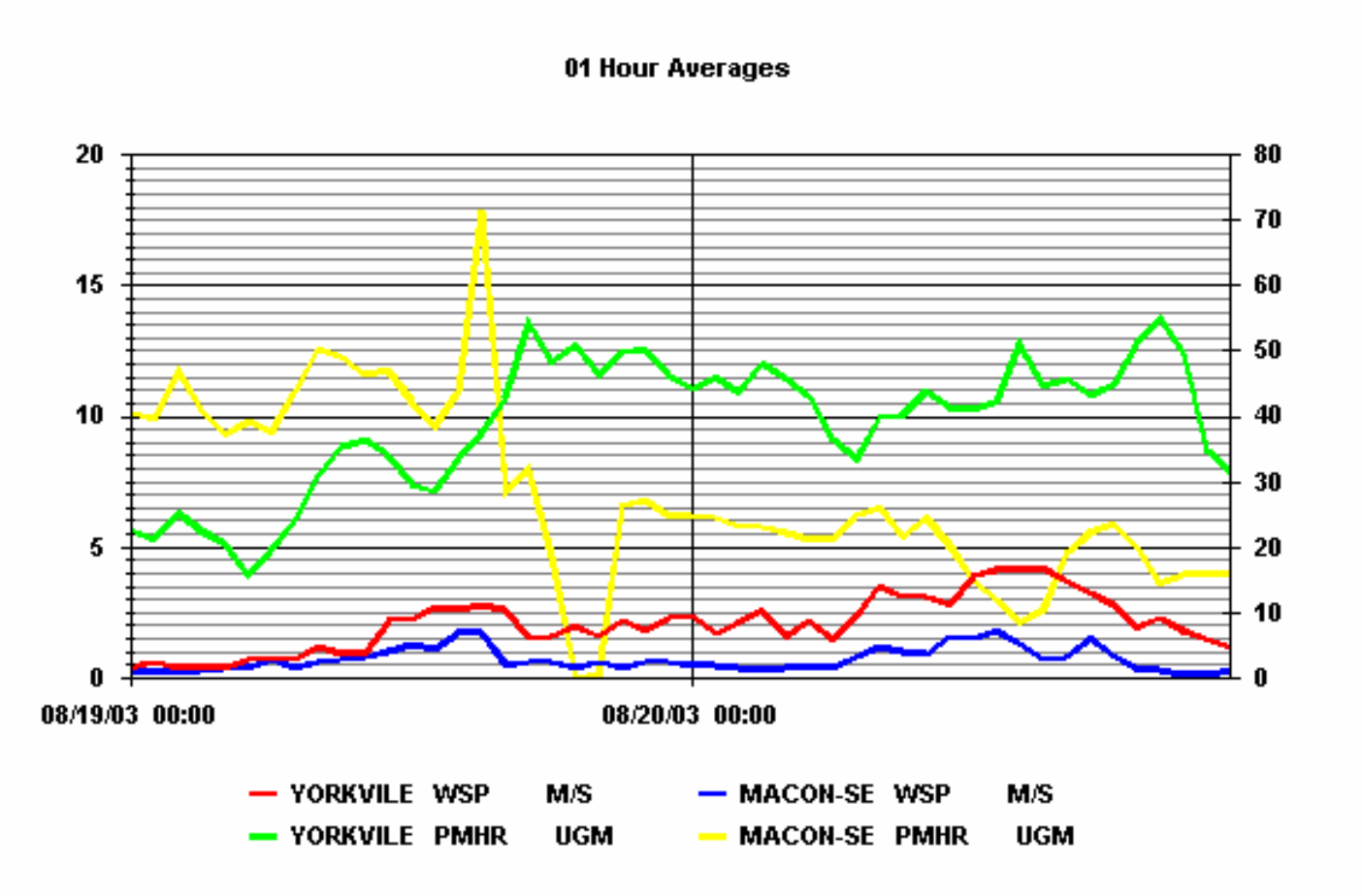
0-hour analysis valid 1200 UTC Tue 19 Aug 2003

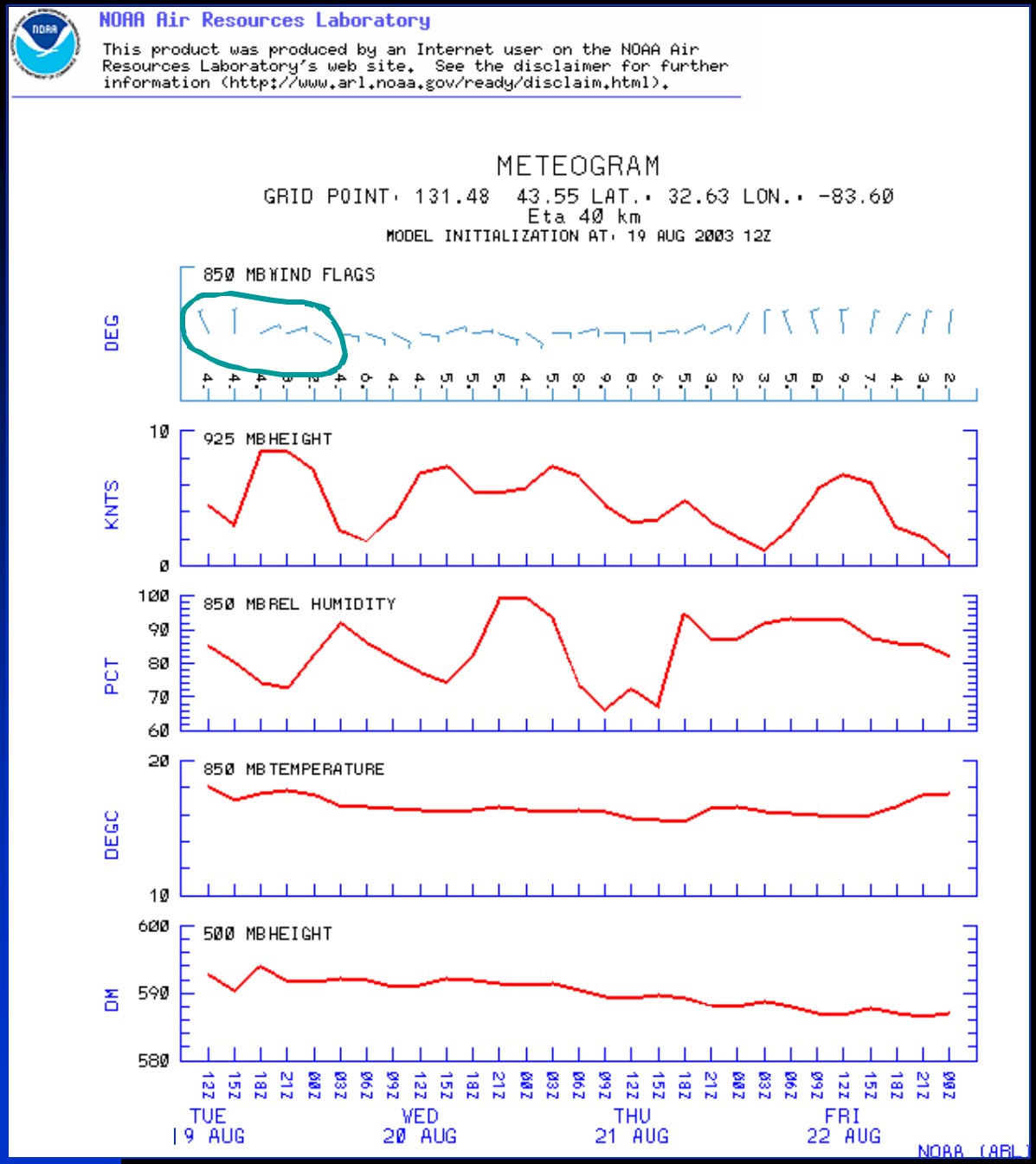
RUC (12z 19 Aug)

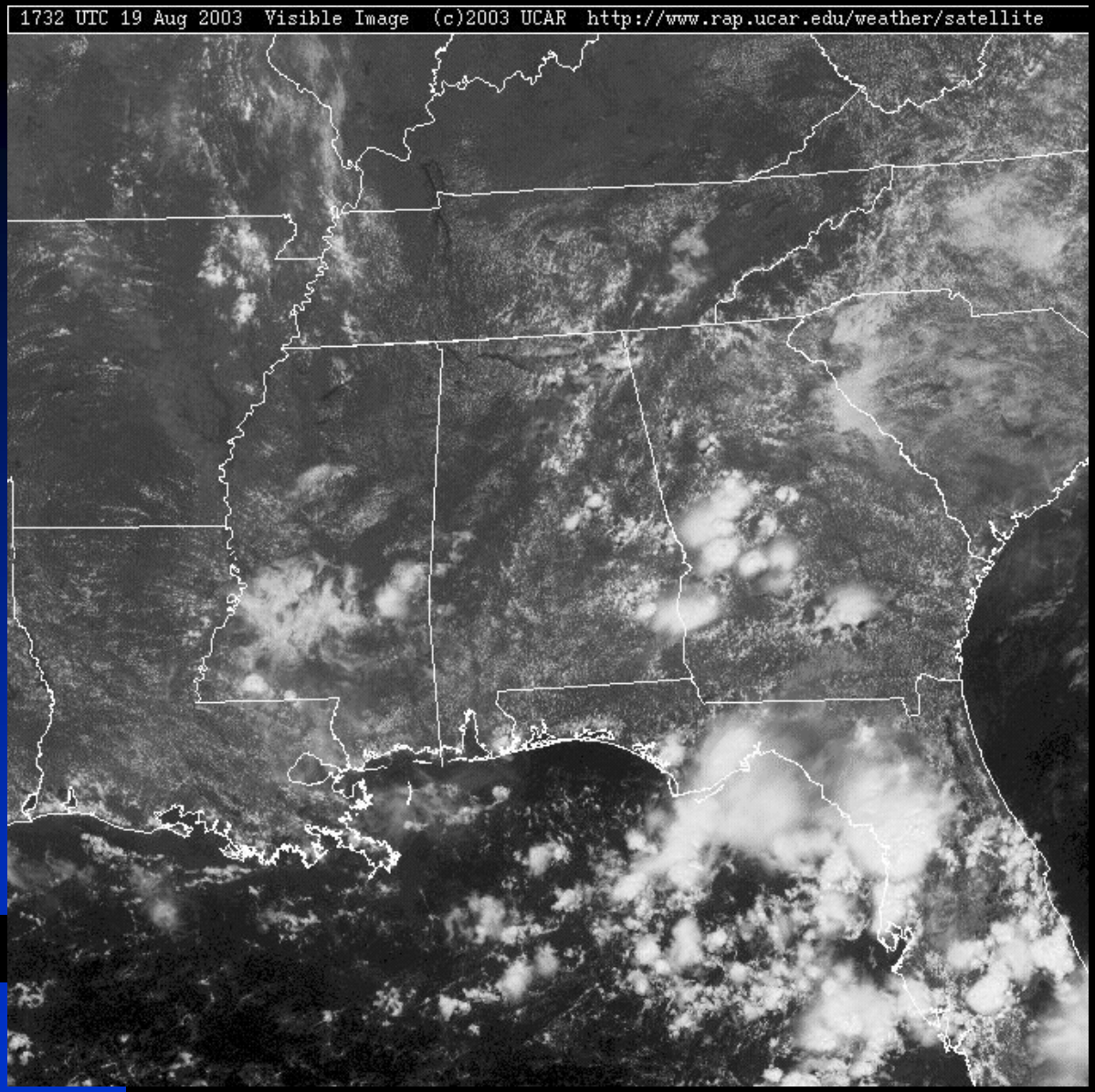



500 mb Heights (dm) / Abs. Vorticity (x10^{-5} s^{-1})
30-hour forecast valid 1800 UTC Wed 20 Aug 2003
GFS (12z 19 Aug)
0 3 6 9 12 15 18 21 24 27 30
(x10^{-5} s^{-1})

Yorkville and Macon PM2.5 8/19/03-8/20/03




NOAA Air Resources Laboratory
This product was produced by an Internet user on the NOAA Air Resources Laboratory's web site. See the disclaimer for further information (http://www.arl.noaa.gov/ready/disclaim.html).
METEOGRAM
GRID POINT: 131.48 43.55 LAT.: 32.63 LON.: -83.60
Eta 40 km
MODEL INITIALIZATION AT: 19 AUG 2003 12Z
850 MB WIND FLAGS
DEG
925 MB HEIGHT
KNTS
10
0
850 MB REL HUMIDITY
PCT
100
90
80
70
60
850 MB TEMPERATURE
DEGC
20
10
500 MB HEIGHT
DM
600
590
580
12Z 15Z 18Z 21Z 00Z 03Z 06Z 09Z 12Z 15Z 18Z 21Z 00Z 03Z 06Z 09Z 12Z 15Z 18Z 21Z 00Z 03Z 06Z 09Z 12Z 15Z 18Z 21Z 00Z
TUE 19 AUG
WED 20 AUG
THU 21 AUG
FRI 22 AUG
NOAA (ARL)


1732 UTC 19 Aug 2003 Visible Image (c)2003 UCAR http://www.rap.ucar.edu/weather/satellite

Conclusion

- Ozone increase at Douglasville was primarily due to recirculation.
- Concurrent PM2.5 increase at Yorkville was due to multiple inversions, slow evolution of mixing height, and light boundary layer winds.
- Macon PM2.5 levels were affected by front and afternoon convection.
- Broad upper level ridge was dominant synoptic feature for this O3 and PM2.5 episode.

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Future:

LIDAR and SODAR will be useful in probing evolution of mixing height and capturing smaller-scale recirculation episodes.

Understanding strength of nocturnal inversion and early morning cap is critical concerning O3 and PM2.5 interplay.

The End